Technology Innovation Project

Project Brief

TIP 281: Impacts Due to Dynamic Transfers

Context

Increasing installations of large amounts of renewable generation are transitioning the electric power industry operating model. Generally power transfers between Balancing Authorities (BAs) and the generating resources that are the source of that power are fixed for an hour. In contrast, intermittent resources can change generation unpredictably many times within an hour. In themselves, those changes can affect path flows and result in challenging operational scenarios. In addition, when wind generation has large changes and when BPA generation reserves are low, BPA cannot provide enough balancing resources for the wind, necessitating the acquisition of balancing resources from other BAs, which in turn will vary in opposition to the wind generation. Utilities are challenged to manage unanticipated flow variations that result from the variation in generation output. This project's main goal is to identify drivers and impacts of generation variability to effectively manage current and future transmission variability.

In 2012, wind turbines in BPA's transmission grid generated over 4,500 megawatts, and at times have exceeded 70% of real-time BPA load. BPA expects to have 5,000 megawatts of this clean, emission-free, renewable resource connected to its system by 2013. Dynamic Transfer is the way to integrate wind reliably into the BPA system and manage the grid effectively.

Description

BPA's plays a vital role in wind power development in the Pacific Northwest. Dynamic Transfer is essential to reliably integrate wind, smart grid and other devices that increase variability. Previous work involving BPA and Maxisys developed a novel Dynamic Transfer algorithm to compute dynamic transfer limitations respecting certain assumed operating restrictions such as acceptable voltage variation at load buses. Variability of paths flows will increase due to the following:

- Increasing penetration levels of intermittent generation.
- Increased reliance on remote balancing of intermittent resources.
- Increased dynamic transfers.
- Increased adoption of smart grid measures, particularly demand responsive loads.
- Application of FACTS (Flexible AC Transmission Solutions) devices.
- Increased reliance on generation RAS to manage events on the transmission system.

A thorough understanding of the impact of Dynamic Transfer on grid operations is critical to ensuring reliable operation and quantifying the true cost to transmission ratepayers. The following questions are relevant:

- How much and how frequently can power transfers vary without causing any adverse impacts on bus voltages?
- How is System Operating Limit (SOL) affected by Dynamic Transfer?
- Is it possible to identify the factors that affect dynamic transfer? Then, what are they? Are the factors the same or different for different paths?
- How will low hydro and high wind affect the system?
- What mitigation measures can be applied?

Why It Matters

The main benefit of the project is to understand how Dynamic Transfer affects the reliability and utilization of static transfer; and to realistically account for the costs of Dynamic Transmission services while integrating more reliably wind and other intermittent energy resources. This research is essential to that reliable integration of wind, smart grid and other devices that increase variability. It will help develop necessary Dispatcher Standing Orders to integrate wind reliably, understand and mitigate system security issues, and identify additional operating costs.

Further, regulatory requirements intercede: FERC Order 890-B states that a transmission provider is obligated to provide generator imbalance service if it is able to acquire resources to do so. If the transmission provider is unable to provide or procure generation imbalance services, the transmission provider must facilitate the use of dynamic scheduling to provide these services, while insuring that any dynamic schedule used for these services can be utilized without adversely affecting reliability. So it is essential to understand the impact due to Dynamic Transfer.

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Goals and Objectives

The project's main goal is to identify drivers and impacts of future variability (due to increased reliance on intermittent resources) so as to successfully manage the effects of transmission variability on transmission system reliability. The objectives of the research are as follows:

- Identify the factors that influence Dynamic Transfer nomograms.
- Model voltage change propagation to the distribution level to set the allowable voltage variation in the transmission system.
- Develop approach to minimize labor-intensive Dynamic Transfer studies.
- Evaluate how Dynamic Transfer limits change with respect to time and system operating conditions.

Project Start Date: October 1, 2012

Project End Date: September 30, 2015

Reports & References (Optional)

Links (Optional)

Participating Organizations

Maxisys

Funding

Total Project Cost:	$799,200
BPA Share:	$799,200
External Share:	$0
BPA FY2013 Budget:	$326,700

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